Annex A
The Economic Case for Road Pricing[1]

Introduction

A.1 The fundamental economic argument for road user charging is that pricing is a useful tool for improving the efficiency of allocating a scarce resource, namely road space. Road use imposes various costs: costs borne by travellers themselves, infrastructure costs on local authorities and the Highways Agency, congestion costs on fellow users, and pollution and other environmental costs borne by the rest of society. It would be desirable if the level and pattern of prices for road use at different times and places better reflected the pattern of these costs. Then road users would face better price signals which would improve the efficiency of their choices. There would be less degradation in terms of excessive congestion and environmental costs, and it would be possible to manage road networks with a margin of reserve capacity. Pricing could also give better signals for investment in new capacity by ensuring that all demand was paying properly for its social costs.

A.2 In congested areas, pricing can improve conditions for road users in ways that other measures cannot easily achieve. By signalling to users the costs of travel, people will make better informed decisions about how and when to travel. They will decide that, for some of their trips, they can change the way in which they travel at relatively little inconvenience to themselves. Other trips will be less flexible or less easily changed and the road user will decide to continue to travel by car, at the congested time. The congestion will be lower, however, to the extent that others have changed their behaviour, so the price paid will buy a quicker, more reliable and less stressful journey, with incentives to share cars and therefore costs. The modelling of road pricing described in this report shows that net time savings related benefits of up to £10 billion a year could be delivered by a national scheme and that local schemes could also deliver commensurate benefits.

A.3 Pricing is only one tool of road network management alongside other methods such as physical traffic management, parking policy, information provision and investment. Pricing is not the only device for allocating scarce resources – but it is a very useful one.

A.4 Roads may be compared in their characteristics with a number of other facilities – e.g. sports stadia, cinemas and theatres. All of these involve the provision of infrastructure, the capacity of which is inherently limited. Demand needs to be managed in some way to ensure that it is consistent with available capacity. Exactly how this is done varies from case to case,

1 This Annex is based on work by the Institute for Transport Studies (ITS) at Leeds prepared by Chris Nash, Peter Mackie, Jeremy Shires and John Nellthorp. A full report is available on the Department for Transport website.

depending on the characteristics of the good, how essential it is, the consequences of excess demand, the predictability of demand, the available pricing techniques and so on. For example, in the case of sporting events, theatres and cinemas, prices are set in advance, but demand is then rationed to available capacity by seating controls. If prices are 'too low', then a secondary market may form – ticket touts, who resell tickets to those who cannot get them by other means and are willing to pay more than the advertised price. If prices are 'too high', then back up services such as last minute ticket kiosks may be used to sell off the excess supply.

A.5 The common factor in supplying these facilities is that some mixture of pricing and rationing is used as a means of managing the markets for them. Road space need not be fundamentally different, but there are difficulties.

A.6 At least for the era of motorised transport, there has been no tradition of direct road user charging in the UK. The charges that have existed have been annual Vehicle Excise Duty (VED), which is simply a lump sum totally unrelated to the use made of the road system, and fuel duty, which has some broad relationship with use, but varies between vehicle types, road types and time of day according to fuel consumption, rather than degree of congestion or other costs. Some other countries, such as France and Italy, have used a dual 'toll road/free road' model but, at the time of the creation of the motorway network in the early 1950s, this was deemed to be unsuitable for UK conditions. So, until the recent M6 Toll road and the London Congestion Charge, our main experience of tolls has been on specific river, estuary and island crossings, and when driving abroad.

A.7 The current forms of charging – fuel duty and VED – are not bad at doing some things, such as influencing the choice of fuel (leaded, unleaded, liquid petroleum gas) and representing the relative average infrastructure costs of different vehicle classes and weights. Fuel duty is also a good instrument for targeting carbon emissions from transport (as these are directly correlated to fuel consumption) and for providing dynamic incentives to produce and purchase fuel efficient vehicles. But these measures represent poorly the relative congestion cost of road space at different times and in different locations. They are just not sufficiently sophisticated instruments to capture congestion and the full range of environmental costs in the price paid by users. The economic case for road user charging rests on there being a social advantage in moving to a system in which prices better reflect the relevant congestion and environmental costs, as well as the infrastructure costs, of using roads.

A.8 How should prices be set? This depends on the characteristics of the good and of the market conditions within which it is delivered. In the case of roads, efficient use of resources, equity/fairness, enforceability, costs of collection and wider effects such as those on planning and land-use and on public transport are all relevant. This Annex concentrates on the efficiency question.

Efficient prices

A.9 A fundamental economic rule is that prices should reflect the incremental costs imposed on society from consumption of the good. Most markets achieve this naturally – commercial firms are incentivised to set prices which recover the incremental costs of production. However, where there are external costs, this breaks down. Pollution or degradation of 'unpriced' resources such as the global atmosphere, clean air or clean water is a classic

example where the producer has no incentive (other than civic duty) to internalise the environmental costs within the costing and pricing decision. Such costs are real, they are imposed on society, but they do not fall on the producer. So prices and output levels are inefficient as a consequence.

A.10 Consider the case of road use. When car users or other vehicle operators decide to make additional trips, or travel additional distances, they impose additional costs on themselves, the infrastructure provider, other users and the rest of society (as shown in Figure A1 below).

Figure A1: Costs of road use[1]

To the user	Time
	Discomfort
	Fuel and other resource costs
	Fuel duties
	Risk of accidents
To the infrastructure provider	Wear and tear
	Marginal costs of use
To other users	Congestion delay
	Increased accident risk
To rest of society	Contribution to climate change
	Pollution
	Noise
	Community borne accident costs
	Visual

1. The entries in the table are illustrative rather than comprehensive.

A.11 If fuel duty correctly reflected the additional wear and tear on the road system of additional vehicle kilometres, then it might be that infrastructure costs would be adequately charged for in the existing system. In fact, fuel duty cannot be set at a rate that simultaneously reflects the very different wear and tear costs imposed by cars, light vans, and heavy goods vehicles of varying axle weights. But, even if this were the case, the traveller would not be considering the impacts on other users, and on the rest of society, in making the decision to travel. A motorist making a journey on a congested road will cause delays to the other vehicles on that road and the surrounding network. These delays are costs which are borne, not by the motorist, but by the rest of the traffic, in the form of increased journey times. This can be seen by comparing the journey time in cities in school holiday weeks, with the journey time in regular weeks. A reduction in traffic of 10-20 per cent reduces the journey times for the remaining traffic appreciably. Similarly, emissions contribute to local air pollution, the costs of which are borne by pedestrians and residents on the route, as well as motorists.

A.12 What road pricing seeks to do is to internalise these external congestion and environmental costs so as to ensure that the traveller pays, not just their own user costs and the marginal wear and tear costs, but the congestion and environmental costs they create as well. Setting efficient prices requires:

- an understanding of the physical relationships between traffic, congestion and environmental costs
- an ability to value, in money terms, changes in congestion and emissions of pollutants when traffic changes
- a technically and economically feasible pricing regime to charge for the congestion and environmental costs.

A.13 Efficient prices fulfil an important function in allowing road users to weigh the value they place on their trip (which only they can know) against the costs associated with it. If the value exceeds the cost, the trip is made. In this way, overall welfare is improved.

A.14 Whether these requirements can be met depends in part on how serious congestion and environmental costs are. Congestion costs have become serious and are forecast to get worse. There is a greater awareness of the risks of climate change as well as of the local environmental impacts and other external costs of road use.

A.15 One of the most important aspects to consider is the variation in congestion and environmental costs in time and space. Even in today's congested conditions, the network as a whole is used at only a small fraction of its rated capacity. For ten hours per day, the entire network is essentially uncongested. On perhaps half of the physical kilometres of the network, congestion is a rare phenomenon at any time. Yet, where serious congestion does occur, it is costly to society.

A.16 The problem is that charging efficient prices via fuel taxation and VED is impossible. The traditional tools are not up to the job, being far too blunt to encourage efficient use of the network. We need a price regime which is capable of reflecting differences in congestion and environmental costs in space and time.

The benefits of road pricing

A.17 Research work[2] using data from the National Transport Model combined with best evidence values of travel time, safety and environmental costs shows two headline results:

- road users pay taxes which cover their average allocated infrastructure costs three or four times over
- but comparing the incremental road wear, congestion and pollution costs of road use with the incremental tax revenue gives a different result. On this basis, on average, the incremental social costs of road use are around two to three times the tax payment.

A.18 This study suggested that, despite the fact that motorists are paying more than the government spends on road infrastructure, when all the costs that arise from their additional journeys are taken into account, there is a case for higher charges.

2 Reference: Sansom *et al.* 2001. *Surface Transport Costs & Charges – Great Britain 1998*, Institute for Transport Studies, Leeds.

A.19 However, averages can only take us so far, because congestion and environmental costs (with the exception of the costs associated with carbon emissions) are highly variable across space and time. When the evidence is split according to road type and time of day, it is found that the social cost of car use is higher, for example, on city radials in the peak period than in predominantly uncongested conditions. So, there are two conclusions:

- efficient use of road space requires a much more differentiated tariff than can be achieved with fuel duty and VED, so as to reflect the variability in social cost of road use
- an efficient tariff, reflecting congestion and environmental costs, would cause some journeys to cost more than now, and others less.

A.20 To the extent that the pattern of change which emerges is seen as unfair or unacceptable, it may be adapted, for instance by using the revenue surplus to make compensating adjustments such as reduced VED and fuel duty or public transport improvements. Even if the revenue were used to reduce income tax, since most people are both road users and income tax payers, motorists would gain an indirect benefit which it is important to take into account in an overall analysis of its effects. Indeed, economic theory shows us that, when we move to a pricing structure that correctly reflects the social costs of people's decisions, it is possible in principle, although difficult in practice, to make each individual better off. Careful choice of scheme and revenue use should be able to combine to produce a fair scheme.

A.21 It is important to note that the current pattern of social costs of road use, as set out in the report referred to above, is only the starting point for the calculation of efficient tariffs. Efficient prices would result in changes in behaviour. People would face a new situation in which they would change their behaviour. They would choose different destinations, times of day and travel modes for their journeys. They would link trips together more. Car occupancy would increase. The prices set would need to take account of the likely market responses. These responses are incorporated in the Department for Transport National Transport Model and in the other models which have been used to assess some of the options for charging described in Chapter 4 of the main report.

Conclusion

A.22 The current taxation tariff for road use does not provide a set of prices which properly represent the social costs of road use including congestion and environmental costs. Tariff restructuring, to rebalance excise duty and fuel duty with a new element reflecting the variability of congestion and environmental costs by time and location, would be desirable in terms of economic efficiency. Charging can make all road users better off, because the trips that matter will take less time and be more reliable. Economic modelling work can show the impacts on users of different classes and on revenue of alternative schemes. Efficiency needs to be considered alongside operational, equity and wider planning factors in determining the overall social advantage of road user charging.